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GEISEL, KARA E	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/559,140	Applicant(s) HING, PAUL ANTHONY	
	Examiner KARA E. GEISEL	Art Unit 2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 21 September 2006.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-53 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-53 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 30 November 2005 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 0106, 0306.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Preliminary Amendment

The preliminary amendment filed on November 30th, 2005, has been entered into this application.

Information Disclosure Statement

The information disclosure statements filed January 11th, 2006 and March 3rd, 2006 have been considered by the examiner.

Specification

The abstract of the disclosure is objected to because it exceeds 150 words in length. Correction is required. See MPEP § 608.01(b).

Claim Objections

Claims 14, 16, 29-32, and 35-41 are objected to because of the following informalities: lack of antecedent basis.

In regards to claim 14, "said excitation (illumination) electromagnetic radiation", there is lack of antecedent basis for this limitation within the claim.

In regards to claim 16, "said micro-optic system", there is lack of antecedent basis for this limitation within the claim.

In regards to claim 29, "said excitation (illumination) electromagnetic radiation", there is lack of antecedent basis for this limitation within the claim.

In regards to claim 30, "the excitation (illumination) electromagnetic radiation", there is lack of antecedent basis for this limitation within the claim.

In regards to claims 35-37, "said overlapping segments", there is lack of antecedent basis for this limitation within the claim.

In regards to claim 41, a claim should be formatted as a single sentence. Claim 41 is formatted into two sentences with two periods. Correction is required.

Appropriate correction is required.

Claims which depend on objected to claims, inherit the problems of these claims, and are therefore, also objected to.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 1, 3, 5, 9-10, 13, 15-16, 19, 20-21, 24-25, 27-28, 30 and 41, the phrase "preferably" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Regarding claims 1, 7-8, 10, 47, 49 and 50, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Regarding claims 1, 7, 10, 15, 45, and 47-50, the phrase "and/or the like" renders the claim(s) indefinite because the claim(s) include(s) elements not actually disclosed (those encompassed by "and/or the like"), thereby rendering the scope of the claim(s) unascertainable. See MPEP § 2173.05(d).

Regarding claims 1, 3-4, 7, 19, 30, 46, and 48-49, the phrase "may" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

The term "within specified tolerances" in claims 12-13 is a relative term which renders the claim indefinite. The term "within specified tolerances" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

In regards to claim 13, it is not clear how the apparatus can comprise "excitation electromagnetic radiation"? Was applicant trying to claim that the apparatus collected excitation radiation, or was applicant trying to claim that the apparatus further comprises a source for causing excitation radiation? Clarification is required. For the purposes of applying art, this limitation will be construed to mean that there is an excitation light source included in the apparatus.

In regards to claim 22, "is spread spectrally onto said photo-electric conversion device(s) capabilities" is confusing and not understood. Clarification is required.

Regarding claims 24 and 50, the phrase "particularly preferred" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Regarding claim 44, the phrase "in particular" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Regarding claim 53, the phrase "particularly used" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claims 50-53 provides for the use of the apparatus of claim 1, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claims 50-53 is rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd.* v. *Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

Claims, which are dependent from rejected claims inherit the problems of these claims, and are therefore also rejected under 35 U.S.C. 112, second paragraph.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-24, 29, and 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodruff (USPN 5,420,681) in view of McNeil et al. (US Pubs 2004/0202577).

In regards to claim 1, Woodruff discloses an apparatus for photo-electric measurement (figs. 2 and 4) comprising: a) a single or a plurality of photo-electric conversion devices (60a), preferably array sensor(s) such as CCD, CMOS, CID and the like (column 3, lines 46-47); b) an optical system (12a-c) which is modularly expandable in one axis or a plurality of axes (as can be seen in fig. 2) in order to acquire electromagnetic radiation from a line or area of any desired size on an object (slit 24 would acquire radiation from a line), with any desired resolution, wherein the said optical system preferably separates the said electromagnetic radiation modularly into a plurality of smaller segments (mirror 26 separates light into the three spectrometers, and gratings 48a also separates light into a plurality of segments), and projects electromagnetic radiation corresponding to the said smaller segments onto said single or a plurality of individual photo-electric conversion devices (60a); and c) sensor electronics related to said photo-electric conversion device(s) (64a). Woodruff is silent to having the sensor electronics enable the operating mode and functionality of said photo-electric conversion device(s) to be defined and changed in real-time, whereby functions such as the readout sequence of pixels and unlimited

flexibility of pixel binning in two dimensions are fully programmable, and said photo-electric conversion device(s) may operate and/or be controlled independently and/or simultaneously.

McNeil discloses an apparatus for photo-electric measurement as well (fig. 2b) comprising a) a single or a plurality of photo-electric conversion devices (203), preferably array sensor(s) such as CCD, CMOS, CID and the like (203); b) an optical system (all components in 259) in order to acquire electromagnetic radiation from a line or area of any desired size on an object with any desired resolution, and project electromagnetic radiation onto said single or a plurality of individual photo-electric conversion devices (203); and c) sensor electronics related to said photo-electric conversion device(s) which enable the operating mode and functionality of said photo-electric conversion device(s) to be defined and changed in real-time, whereby functions such as the readout sequence of pixels and unlimited flexibility of pixel binning in two dimensions are fully programmable, and said photo-electric conversion device(s) may operate and/or be controlled independently and/or simultaneously (¶ 70, and 121-124). This is done in order to allow more control over the detection set up for the operator, and in order to improve the SNR from sample to sample. Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to include into Woodruff's apparatus for photo-electric measurement the sensor electronics of McNeil which enable the operating mode and functionality of said photo-electric conversion device(s) to be defined and changed in real-time, whereby functions such as the readout sequence of pixels and unlimited flexibility of pixel binning in two dimensions are fully programmable, and said photo-electric conversion device(s) may operate and/or be controlled independently and/or simultaneously in order to allow more control over the detection set up for the operator, and in order to improve the SNR from sample to sample.

In regards to claim 2, said segments of electromagnetic radiation originate from a plurality of overlapping regions on the line or area to be measured (the segments which are separated by the mirror 26

and the grating 46a of Woodruff all come from the same line from slit 24, and therefore originate from a plurality of overlapping regions on the line).

In regards to claim 3, the said segments of electromagnetic radiation originate from one or a plurality of regions on the line or area to be measured, whereby the regions are adjacent to each other, or there may be space corresponding to regions of no measurement interest between the said regions, wherein the apparatus preferably provides its functionality only for regions to be measured (Woodruff; depending on how you define the line obtained from slit 24 being measured, there would be one region, the line, or a plurality of regions, sections of the lines, adjacent to each other).

In regards to claim 4, said optical system provides a magnification which may be more than, equal to, or less than one (Woodruff via 52a and 54a).

In regards to claims 5-6, the detector can be any desired (Woodruff column 3, lines 46-47), which would include a plurality of readily available, off-the-shelf array sensors positioned adjacent to each other, wherein said array sensors preferably comprise semiconductor die(s) which are housed in an integrated circuit package or a plurality of buttable array sensors positioned adjacent to each other, being stackable side-to-side such that there is minimum dead space between the active areas.

In regards to claim 7, the electronics of McNeil, cause the photo-electric conversion device(s) to include any one or any subset of the following features: a) a means of clearing charge from the photo-electric conversion device(s) very fast, such as the draining of all charge in the photo-electric conversion device and/or in serial register(s) of said photo-electric conversion device via a single pulse, or the like, b) summing well(s) at each of the output(s) of the photo-electric conversion devices, c) metal strapped gates and connections to increase clocking speeds, d) thinned, back-illuminated CCD technology, e) low dark current "Multi-Pinned Phase (MPP)" operation mode, f) frame transfer architecture, g) interline transfer architecture, h) full-frame transfer architecture, i) charge amplification on the photo-electric conversion device, such as by avalanche or impact ionisation effects or the like, j) fiber optic bundle(s) directly

bonded to the photo-electric conversion device, k) a single or a plurality of outputs, l) a single or a plurality of serial (readout) register(s), m) segmentation of the photo-electric conversion device(s), whereby all segments may be read and/or controlled individually and/or simultaneously. n) integrated microlenses, o) anti-blooming in the active area, storage area and/or serial register(s). p) Charge multiplication integrated on the image sensor (McNeil ¶s 121-124).

In regards to claim 8, said optical system comprises the integration of one or any combination of micro-optical components such as refractive, diffractive, reflective, absorptive elements, fiber optical, and/or spatially filtering elements (34, 40a-55a), and/or one or more arrays thereof (Woodruff each module 12a-c has components 40a-55a).

In regards to claim 9-10, the combined device comprises an enclosure which houses the photo-electric conversion device(s) but is silent to a cooling means for cooling and controlling the temperature, and for preventing condensation on the devices. However, the Examiner takes Official Notice that it is well known in the art to have a means for cooling photo-electric conversion device(s) in order to remove measurement errors and possible destruction of the photo-electric conversion device(s) due to overheating. Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to include in the combined device a cooling means for cooling and controlling the temperature, and for preventing condensation on the devices in order to remove measurement errors and possible destruction of the photo-electric conversion device(s) due to overheating.

In regards to claim 11, said optical system forms an integral part of an enclosure which houses said photo-electric device(s) (Woodruff optical system 40a-55a is attached to enclosure 16, thereby forming an integral part of the enclosure).

In regards to claim 12, the Examiner notes that the claim limitation “said optical system is factory pre-aligned spatially and spectrally with respect to said photo-electric conversion device(s)” is drawn to a process of manufacturing which is incidental to the claimed apparatus. It is well established that a

claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113). The focal plane of the object to be measured and the positioning of the electromagnetic radiation incident on the device is within specified tolerances (since the specified tolerances are not disclosed in the claims or the specification in such as way so as to know what the tolerances are, any tolerances would meet this limitation, and therefore, this combination meets this limitation).

In regards to claim 13, Woodruff is silent to having a source for producing excitation (illumination) electromagnetic radiation. However, this invention is mainly an imaging spectrometer, and the Examiner takes Official Notice that imaging spectrometers are well known to be used in fluorescence measuring, which would require a source for producing excitation (illumination) electromagnetic radiation.

For example, McNeil discloses a similar apparatus for photo-electric measurement (fig. 2b). McNeil's device comprises a source for producing excitation (illumination) electromagnetic radiation (240). This source is included in order to perform fluorescence measurements (¶ 61). Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to include into Woodruff's apparatus for photo-electric measurement a source for producing excitation (illumination) electromagnetic radiation (including all the optics in front of the source in order to direct the light to the sample) in order to be able to use the device for fluorescence measurement. The Examiner notes that the claim limitation "...is factory pre-aligned spatially with respect to the said optical system and said photo-electric conversion device(s)" is drawn to a process of manufacturing which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight

(see MPEP 2113). The measurement performance is optimized within specified tolerances (since the specified tolerances are not disclosed in the claims or the specification in such as way so as to know what the tolerances are, any tolerances would meet this limitation, and therefore, this combination meets this limitation).

In regards to claim 14, the combination including the light source for producing excitation electromagnetic radiation is discussed above. The combined apparatus would further include means for coupling into the optical system, and focusing said excitation (illumination) electromagnetic radiation at the line or area to be measured (McNeil fig. 2B, 251, 257 and 258).

In regards to claim 15, the apparatus includes a means for spatially varying the said excitation (illumination) at the line or area to be measured (McNeil fig. 2B, 423 and 258).

In regards to claim 16, all components of the apparatus are tightly integrated into a compact, miniaturized measurement unit, preferably with all components of said micro-optic system permanently fixed relative to each other and to said photo-electric conversion device(s), with no mechanical adjustments (as can be seen in fig. 2; and 4 of Woodruff; it is noted that tightly and compact are broad terms of degree, and since these limitations have not been defined in the claims, any compact package would meet this limitation).

In regards to claim 17, the said optical system includes a means for spreading electromagnetic radiation according to wavelength, and projects the resulting spectra onto said photo-electric conversion device(s) (Woodruff 48a).

In regards to claim 18, the functionality of said optical system and said photo-electric conversion device(s) is spatially variable, such that for example measurements of various types can be simultaneously performed (Woodruff column 1, lines 50-55; different spectral ranges are performed on each spectrometer).

In regards to claim 19, said optical system is a confocal system, and comprises at least one spatial filter (Woodruff 24) whereby electromagnetic radiation from a plurality of points on the line or area to be measured is spatially filtered at particular refocusing points and/or planes, and said spatial filter is preferably implemented by a pinhole or slit (slit 24) which may be implemented using absorptive, diffractive, refractive element(s), and/or may be defined by one or a plurality of programmable sub-area(s) of pixels of said photo-electric conversion device(s).

In regards to claim 20, the apparatus is modularly expanded in a first direction to measure a particular length of a line on an area presented by a target object (as can be seen in fig. 2 of Woodruff), and comprises means for moving, the apparatus preferably in a stepped and/or scanned manner in a second direction in order to measure said area (column 1, lines 10-12; the imager can be used in an aircraft or space craft which would be a means to move the apparatus in a second direction).

In regards to claim 21, said apparatus produces image(s) of an area or a plurality of sub-areas thereof (Woodruff column 1, lines 35-55), whereby said photo-electric conversion device(s) is/are preferably operated in "Time Delayed Integration" mode, line scanning mode, or imaging mode (imaging mode).

In regards to claim 22, the electromagnetic radiation from the area to be measured, or sub-areas thereof, is spread spectrally onto said photo-electric conversion device(s) (Woodruff via 48a) and wherein the spectral axis is perpendicular to the axis of movement of the apparatus (since the device can be on an aircraft, the aircraft would be moving in the direction out of the paper of fig. 4, and therefore perpendicular to the spectral axis).

In regards to claim 24, said means of spreading electromagnetic radiation according to wavelength comprises a binary grating, particularly preferred is a single level or single mask binary grating, wherein the odd or minus one and even or plus one first order spectra are both acquired simultaneously by the apparatus (Woodruff 48a).

In regards to claim 29, the combination including the light source for producing excitation electromagnetic radiation is discussed above. Said excitation (illumination) source and related electronics would be an integral part of the apparatus, whereby said optical system delivers electromagnetic radiation from said optical source to the object to be measured (the light source module including optics of fig. 2B, would be included in the combined device as discussed above).

In regards to claim 33, the apparatus further comprises a means of mechanically moving and/or positioning the apparatus in up to three dimensions with respect to the object to be measured, wherein the said means of positioning is further controllable by said controller in real time during measurement (Woodruff 26, and column 3, lines 48-50).

In regards to claim 34, the combined apparatus comprises a controller (Woodruff 64a), and an intelligent detector (when combined with sensor electronics of McNeil), wherein said controller is an integral part of the apparatus (as can be seen in fig. 4 of Woodruff).

In regards to claim 35, the apparatus comprises means for separately transmitting the results of measurements from the said overlapping segments to the said controller, where they are combined into a single data stream (McNeil ¶ 122).

In regards to claim 36, the apparatus comprises means for combining the results of measurements from the said overlapping segments into a single data stream by the said sensor electronics, and for transmitting the single data stream to the said controller (McNeil ¶ 121).

Claims 1-24, 29, 33-36, and 43-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hing (WO 02/25934), as cited by the applicant in view of Woodruff (USPN 5,420,681).

In regards to claim 1, Hing discloses apparatus for photo-electric measurement (fig. 1) comprising: a) a single or a plurality of photo-electric conversion devices, preferably array sensor(s) such as CCD, CMOS, CID and the like (30 and page 10, lines 10-12); b) an optical system which projects electromagnetic radiation onto said single or a plurality of individual photo-electric conversion devices

(5); and c) sensor electronics related to said photo-electric conversion device(s) which enable the operating mode and functionality of said photo-electric conversion device(s) to be defined and changed in real-time, whereby functions such as the readout sequence of pixels and unlimited flexibility of pixel binning in two dimensions are fully programmable, and said photo-electric conversion device(s) may operate and/or be controlled independently and/or simultaneously (20 and page 9, line 11 - page 10, line 3). Hing is silent to having the optical system be expandable in one axis or a plurality of axes in order to acquire electromagnetic radiation from a line or area of any desired size on an object, with any desired resolution, wherein the said optical system preferably separates the said electromagnetic radiation modularly into a plurality of smaller segments. However, this invention is mainly directed to the photo-electric conversion device(s) and the sensor electronics, and it is disclosed that this device can be used for spectroscopy (page 8, line 15) which would require spectroscopic optics.

Woodruff discloses an apparatus for photo-electric measurement using spectroscopy (figs. 2 and 4) comprising: a) a single or a plurality of photo-electric conversion devices (60a); b) an optical system (12a-c) which is modularly expandable in one axis or a plurality of axes (as can be seen in fig. 2) in order to acquire electromagnetic radiation from a line or area of any desired size on an object (slit 24 would acquire radiation from a line), with any desired resolution, wherein the said optical system preferably separates the said electromagnetic radiation modularly into a plurality of smaller segments (mirror 26 separates light into the three spectrometers, and gratings 48a also separates light into a plurality of segments), and projects electromagnetic radiation corresponding to the said smaller segments onto said single or a plurality of individual photo-electric conversion devices (60a). The modular spectroscopic device has the benefit of having flexible construction and ease of replacing the parts (column 1, lines 58-61). Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to use the spectroscopic device of Woodruff as the optical system which projects electromagnetic radiation onto said single or a plurality of individual photo-electric conversion devices of Hing's in order to have

Hing's device be used as a spectroscopy device, and in order to have the benefit of a flexible compact construction with the easily replaced parts.

In regards to claim 2, said segments of electromagnetic radiation originate from a plurality of overlapping regions on the line or area to be measured (the segments which are separated by the mirror 26 and the grating 46a of Woodruff all come from the same line from slit 24, and therefore originate from a plurality of overlapping regions on the line).

In regards to claim 3, the said segments of electromagnetic radiation originate from one or a plurality of regions on the line or area to be measured, whereby the regions are adjacent to each other, or there may be space corresponding to regions of no measurement interest between the said regions, wherein the apparatus preferably provides its functionality only for regions to be measured (Woodruff; depending on how you define the line obtained from slit 24 being measured, there would be one region, the line, or a plurality of regions, sections of the lines, adjacent to each other).

In regards to claim 4, said optical system provides a magnification which may be more than, equal to, or less than one (Woodruff via 52a and 54a).

In regards to claim 7, said photo-electric conversion device(s) include any one or any subset of the following features: a) a means of clearing charge from the photo-electric conversion device(s) very fast, such as the draining of all charge in the photo-electric conversion device and/or in serial register(s) of said photo-electric conversion device via a single pulse, or the like, b) summing well(s) at each of the output(s) of the photo-electric conversion devices, c) metal strapped gates and connections to increase clocking speeds, d) thinned, back-illuminated CCD technology, e) low dark current "Multi-Pinned Phase (MPP)" operation mode, f) frame transfer architecture, g) interline transfer architecture, h) full-frame transfer architecture, i) charge amplification on the photo-electric conversion device, such as by avalanche or impact ionisation effects or the like, j) fiber optic bundle(s) directly bonded to the photo-electric conversion device, k) a single or a plurality of outputs, l) a single or a plurality of serial (readout)

register(s), m) segmentation of the photo-electric conversion device(s), whereby all segments may be read and/or controlled individually and/or simultaneously. n) integrated microlenses, o) anti-blooming in the active area, storage area and/or serial register(s). p) Charge multiplication integrated on the image sensor (page 2, lines 17-27, and page 12, lines 1-7).

In regards to claim 8, said optical system comprises the integration of one or any combination of micro-optical components such as refractive, diffractive, reflective, absorptive elements, fiber optical, and/or spatially filtering elements (34, 40a-55a), and/or one or more arrays thereof (Woodruff each module 12a-c has components 40a-55a).

In regards to claim 9, the apparatus comprises a cooling means, preferably using thermoelectric (Peltier) device(s) for cooling and/or temperature regulating said photo-electric conversion device(s) (Hing fig. 2, 40 and page 13, line 14 - page 14, line 28).

In regards to claim 10, the apparatus comprises an enclosure which houses said cooled photo-electric conversion device(s) and related cooling means for preventing condensation on surfaces which are in the optical path, wherein said enclosure is preferably hermetically sealed, and more preferably under vacuum or filled with an inert gas such as Argon or the like (Hing fig. 5, and page 13, line 14 - page 14, line 28).

In regards to claim 11, said optical system forms an integral part of an enclosure which houses said photo-electric device(s) (Woodruff optical system 40a-55a is attached to enclosure 16, thereby forming an integral part of the enclosure).

In regards to claim 12, the Examiner notes that the claim limitation “said optical system is factory pre-aligned spatially and spectrally with respect to said photo-electric conversion device(s)” is drawn to a process of manufacturing which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject

product-by-process claim limitation is not afforded patentable weight (see MPEP 2113). The focal plane of the object to be measured and the positioning of the electromagnetic radiation incident on the device is within specified tolerances (since the specified tolerances are not disclosed in the claims or the specification in such as way so as to know what the tolerances are, any tolerances would meet this limitation, and therefore, this combination meets this limitation).

In regards to claim 13, the apparatus comprises a source for producing excitation (illumination) electromagnetic radiation (Hing fig. 1, 11). The Examiner notes that the claim limitation "...is factory pre-aligned spatially with respect to the said optical system and said photo-electric conversion device(s)" is drawn to a process of manufacturing which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113). The measurement performance is optimized within specified tolerances (since the specified tolerances are not disclosed in the claims or the specification in such as way so as to know what the tolerances are, any tolerances would meet this limitation, and therefore, this combination meets this limitation).

In regards to claim 14, said optical system includes a means for coupling (Hing, fig. 1, 5) into the optical system, and focusing said excitation (illumination) electromagnetic radiation (from 11) at the line or area to be measured (line or area measured on sample 3).

In regards to claim 15, the apparatus includes a means for spatially varying the said excitation (illumination) at the line or area to be measured, wherein said means is preferably real-time programmable, preferably integrated with the optical system, and most preferably uses LCD-, acousto-optic-, micro-mirror-based spatial light modulator(s) or the like (Hing page 9, lines 18-20).

In regards to claim 16, all components of the apparatus are tightly integrated into a compact, miniaturized measurement unit, preferably with all components of said micro-optic system permanently

fixed relative to each other and to said photo-electric conversion device(s), with no mechanical adjustments (the device would be set up similar to Woodruff fig. 4, with the photo-electric conversion device(s) being set up like figs. 2-3).

In regards to claim 17, the said optical system includes a means for spreading electromagnetic radiation according to wavelength, and projects the resulting spectra onto said photo-electric conversion device(s) (Woodruff 48a).

In regards to claim 18, the functionality of said optical system and said photo-electric conversion device(s) is spatially variable, such that for example measurements of various types can be simultaneously performed (Woodruff column 1, lines 50-55; different spectral ranges are performed on each spectrometer).

In regards to claim 19, said optical system is a confocal system, and comprises at least one spatial filter (Woodruff 24) whereby electromagnetic radiation from a plurality of points on the line or area to be measured is spatially filtered at particular refocusing points and/or planes, and said spatial filter is preferably implemented by a pinhole or slit (slit 24) which may be implemented using absorptive, diffractive, refractive element(s), and/or may be defined by one or a plurality of programmable sub-area(s) of pixels of said photo-electric conversion device(s).

In regards to claim 20, the apparatus is modularly expanded in a first direction to measure a particular length of a line on an area presented by a target object (as can be seen in fig. 2 of Woodruff), and comprises means for moving, the apparatus preferably in a stepped and/or scanned manner in a second direction in order to measure said area (Hing fig. 1, 4).

In regards to claim 21, said apparatus produces image(s) of an area or a plurality of sub-areas thereof (Hing, fig. 1, 3, would produce images of the sample), whereby said photo-electric conversion device(s) is/are preferably operated in "Time Delayed Integration" mode, line scanning mode, or imaging mode (imaging mode).

In regards to claim 22, the electromagnetic radiation from the area to be measured, or sub-areas thereof, is spread spectrally onto said photo-electric conversion device(s) (Woodruff via 48a) and wherein the spectral axis is perpendicular to the axis of movement of the apparatus (Hing fig. 1, 3, the movement of the apparatus being perpendicular to the spectral axis of spreading is a matter of design choice and would be obvious to one of ordinary skill in the art in order to scan the entire sample spectrally).

In regards to claim 24, said means of spreading electromagnetic radiation according to wavelength comprises a binary grating, particularly preferred is a single level or single mask binary grating, wherein the odd or minus one and even or plus one first order spectra are both acquired simultaneously by the apparatus (Woodruff 48a).

In regards to claim 29, said excitation (illumination) source (Hing fig. 1, 11) and related electronics (20) is an integral part of the apparatus (as can be seen in fig. 1), whereby said optical system (5) delivers electromagnetic radiation from said optical source to the object to be measured (3).

In regards to claim 33, the apparatus comprises a means of mechanically moving and/or positioning the apparatus in up to three dimensions with respect to the object to be measured (Hing fig. 1, 4), wherein the said means of positioning is further controllable by said controller in real time during measurement (20).

In regards to claim 34, the apparatus comprises a controller (Hing fig. 1, 20), and an intelligent detector (20 and 30), wherein said controller is an integral part of the apparatus (as can be seen in fig. 4).

In regards to claim 35, the apparatus comprises means for separately transmitting the results of measurements from the said overlapping segments (Hing, fig. 4, 61) to the said controller (27 is part of the controller), where they are combined into a single data stream.

In regards to claim 36, the apparatus comprises means for combining the results of measurements from the said overlapping segments into a single data stream (Hing, fig. 4, 27) by the said sensor electronics, and for transmitting the single data stream to the said controller (36).

In regards to claim 43, the combined apparatus discloses a method of optimizing performance in real-time during measurement from plane areas which are tilted (non-parallel) with respect to the apparatus, using the apparatus according to claim 34 (see above), wherein the position of the apparatus is adapted during the measurement such that the focus along the entire measurement line is optimal (page 9, line 27 - page 10, line 3 and claim 29, section a).

In regards to claim 44, the combined apparatus discloses a method for optimization of sensitivity of the apparatus according to claim 34 (see above) in real time during the measurement process, whereby the location and size of the sub-areas of pixels used to measure particular wavelength bands of the spectra projected onto said photo-electric conversion device(s) are optimized by the said controller based on information previously acquired by the apparatus, wherein in particular, spectral resolution versus sensitivity tradeoff is optimized (page 12, line 15 - page 13, line 11).

In regards to claim 45, the combined apparatus discloses a method for optimization of the performance of the apparatus according to claim 34 (see above) in real time during the measurement process, whereby the spectral axis of measurement on the said photo-electric conversion device(s) is calibrated in real time using information derived from the current or previously measured spectra, wherein preferred features in the spectra which are used for the said optimization include the excitation (illumination) signal, reference spectral standards on the object to be measured, known RAMAN scatter profiles, and the like (page 9, line 27 - page 10, line 9; any optimization can be used).

In regards to claim 46, the combined apparatus discloses a method of optimizing performance in real-time during measurement using the apparatus according to claim 34 (see above), wherein information is acquired by the apparatus from the object to be measured, and directly used to optimize the measurements, wherein said information may originate from a sample carrier, and/or from the samples themselves (page 9, line 27 - page 10, line 9 and claim 29).

In regards to claim 47, the combined apparatus discloses a method of optimizing performance in real-time during measurement using the apparatus according to claim 34 (see above), wherein optical and measurement effects of mechanical tolerances, non-ideal mechanical motion such as jitter, vibration, hysteresis, and the like are reduced or eliminated, wherein spectral effects by real-time spectral calibration, using references on the object for optimization of measurements in real-time, are corrected (page 9, line 27-page 10, line 9 and claim 29).

In regards to claim 48, the combined apparatus discloses a method of automating the processing and/or information management of the target object(s) and/or samples to be measured using the apparatus according to claim 34 (see above), wherein information acquired by the apparatus from said object or samples to be measured may serve as identification, may define or influence the processing, or the like, wherein said information may originate from a sample carrier, and/or from the samples themselves (page 9, line 27-page 10, line 9 and claim 29).

In regards to claim 49, the combined apparatus discloses a method for information management of the target object(s) and/or samples to be measured using the apparatus according to claim 34 (see above), wherein the apparatus may store or write information on the said object or samples, such as date, time, measurement parameters, results, and the like (page 5, lines 11-19).

Additional Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art made of record is Bleau et al. (US Pubs 2004/0239773).

Bleau discloses an apparatus for photo-electric measurement.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kara E Geisel whose telephone number is **571 272 2416**. The examiner can normally be reached on Monday through Friday, 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on **571 272 2800 ext. 77**. The fax phone number for the organization where this application or proceeding is assigned is **571 273 8300**.

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/Kara E Geisel/
Patent Examiner,
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